Supporting Information

Spectroscopic Investigation of Plasma-Fluorinated Monolayer Graphene and Application for Gas Sensing

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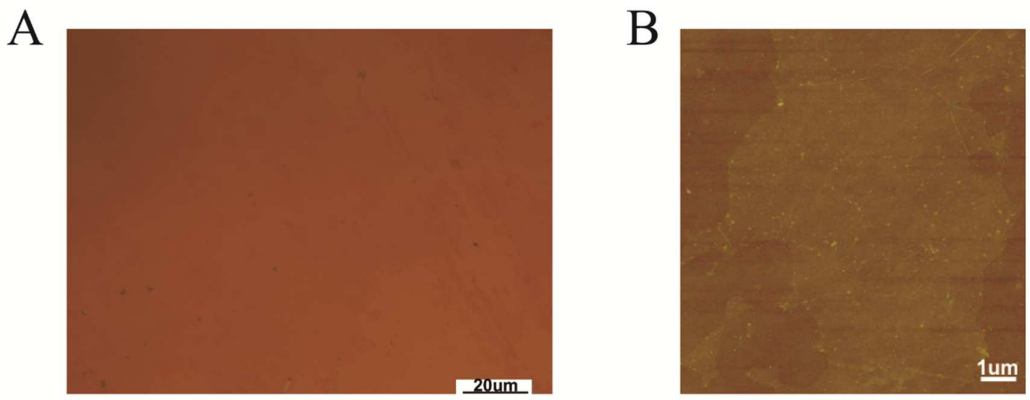

Figure S1. The optical microscopy (A) and low magnified AFM image (B) of FG-20 film.

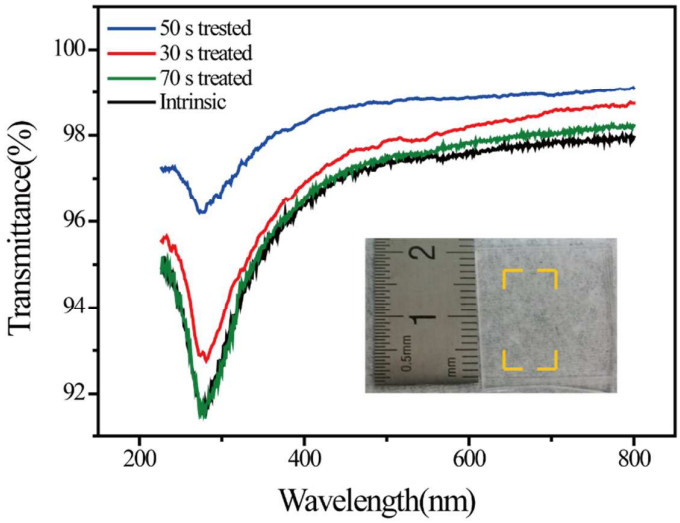

Figure S2. Ultraviolet-visible spectra (UV-vis) of intrinsic monolayer graphene and FG with 30 s, 50 s and 70 s plasma treatment.

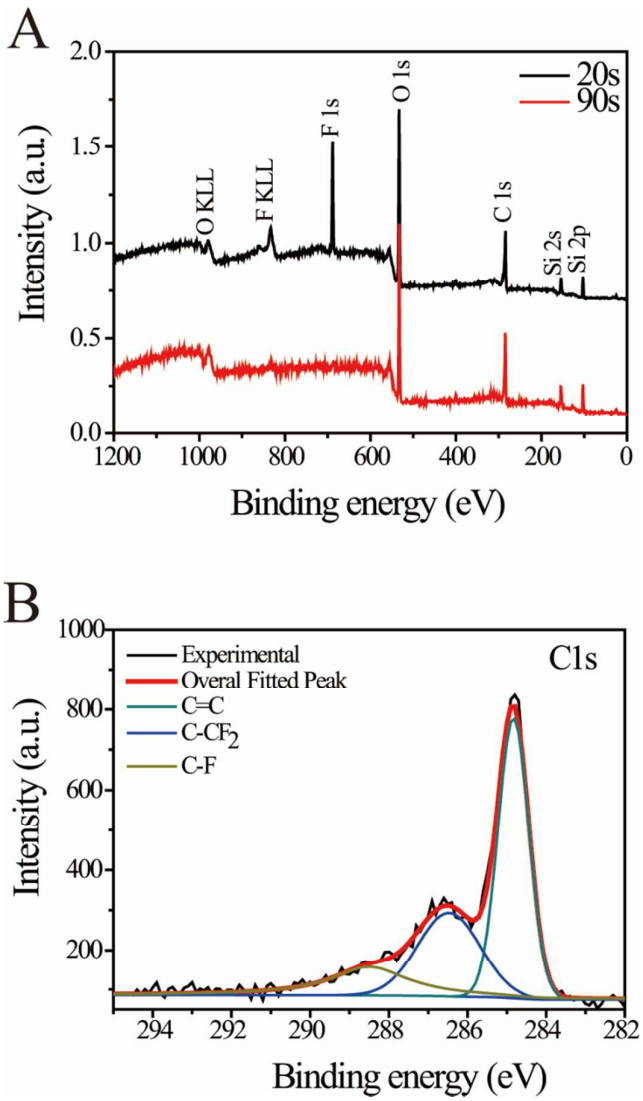

Figure S3. (A)XPS survey scan of FG-20 and FG-90 with fluorine content ~24.6% and ~4.6% respectively. (B) C1s high resolution spectra of FG-90.

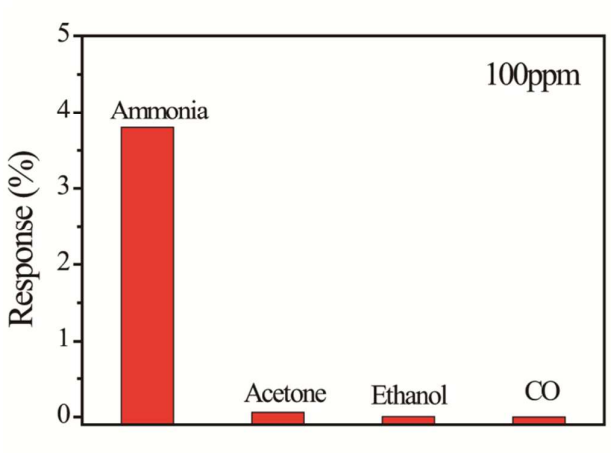

Figure S4. The responses of FG-20 based gas sensor for ammonia, CO, acetone and ethanol gas/vapor under air atmosphere at room temperature.

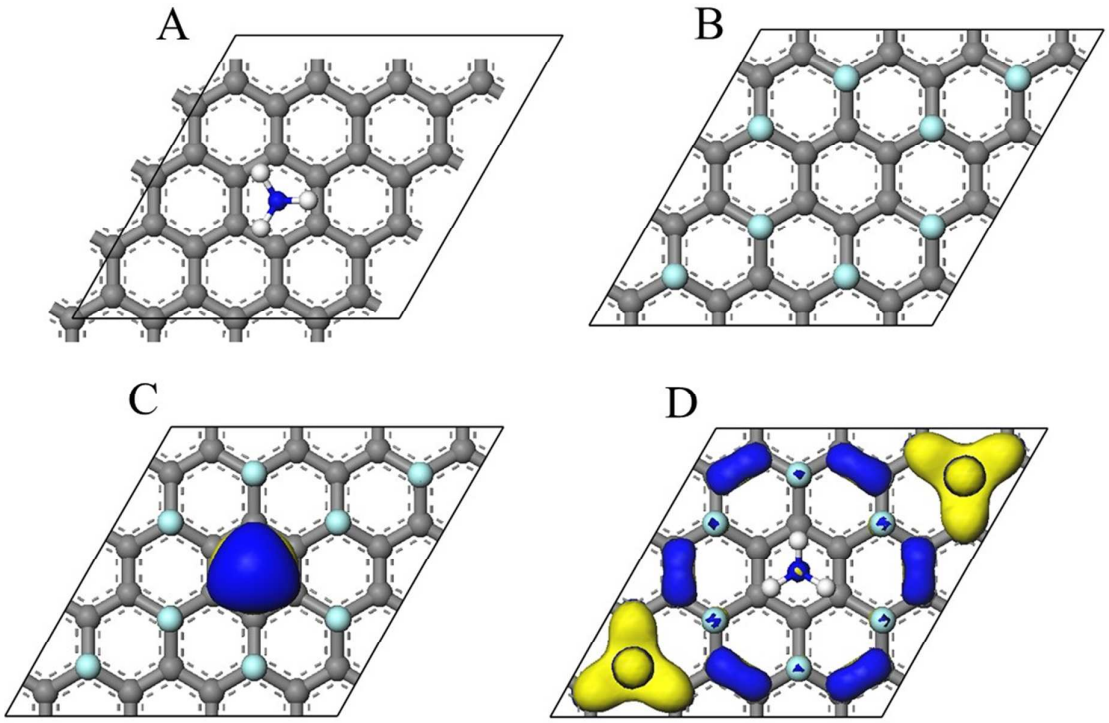

Figure S5. The most stable adsorption configuration of NH_3 on graphene (A) and $CF_{0.25}$(B); The HOMO (C) and LUMO (D) of FG with ammonia adsorption.

Table S1. The content of fluorine and ration of C/F responding with the plasma treated time.

Treatment time	0s	10s	20s	30s	40s	50s	60s	90s
F At%	0	20.16	24.59	18.74	14.74	13.16	10.95	4.56
C-F	C	C_4F	$C_{3.1}F$	$C_{4.3}F$	$C_{5.8}F$	$C_{6.6}F$	$C_{8.1}F$	$C_{20.9}F$

Table S2. The Comparison of different sensor parameters of various device structures based on graphene and graphene dendrite.

Type	**Graphene type**	**operating condition**	**detection levels/range**	**response**	**response time**	**recovery time**	**reference**
Resistive	CVD- graphene	150-200°C	65-75 ppm	3.8-4.3%	~9-14 min	~7-12 min	1
FET	Partial reduced graphene oxide	Room temperature	1%	22.2% ((Gg-Ga) /Ga)	~30 min	50 h	2
resistive	vertically oriented graphene sheets	Room temperature	1%	1.13%	15min	25min	3
Resistive	Graphene-Pt NPs	25-100°C	6-58ppm	2%-15%	~15min	>50min	4
resistive	Fluorinated CVD-graphene	room temperature	2-100ppm	0.3-3.8%	30s	<200s	this work

Reference:

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3. Yu, K.; Wang, P.; Lu, G.; Chen, K.-H.; Bo, Z.; Chen, J., Patterning Vertically Oriented Graphene Sheets for Nanodevice Applications. J. Phys. Chem. Lett. 2011, 2, 537-542.

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